

2 Health Physics in the Oxide Conversion Area

HEALTH PHYSICS IN THE OXIDE CONVERSION AREA

Prior to the start of operation of the modified Oxide Conversion Facility, a training program was presented to those employees who were to operate and maintain the equipment, as well as the foreman who would supervise the operation and maintenance. Since that time, there have been changes in both personnel and operating technique that warrent a review of the basic Health Physics aspects of the operation and maintenance of the facility and, in addition, some other knowledge of the Health Physics Department's protection program.

Let us digress for a few minutes and talk about the state of the art of Oxide Conversion, as practiced here at GAT. The present facility is a production plant; however, there have been many changes and renovations since the original design was conceived, and there are still more changes on the drawing board. Many of these changes were incorporated in the facility to increase the production and ease of operation; however, many were also brought about by the need to better control the contamination and airborne levels in the facility.

The areas which make up the Oxide Conversion Facility were never intended to be "clean" areas. The wearing of protective apparel by those actively engaged in the operation and maintenance of the equipment is a must and will probably always be a must. Normally, the levels of the contamination on the floors and equipment do not require the wearing of respiratory protection equipment. Respiratory protection is required when high airborne activity is present in any of the areas; when due to the nature of the work being performed, airborne activity may be expected or when working through an open glove port or open glove box, Respiratory

APPROVED FOR RELEASE BY:

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DOR Jg 2/24/00

protection is **always** required when working inside of any glove box.

(The Lower Tower glove box is the only one where you need to physically get inside.)'

When donning an assault mask, be sure that it fits properly and that you have a good seal around the face. A good seal can be determined by placing your hand over the canister opening, and inhaling. The mask should draw in toward your face. When wearing an air hood, be sure that the draw string is snug around your neck. This allows the air pressure to fill out the head enclosure and ensure a positive pressure inside the hood.

Speaking of protective equipment, perhaps this would be an appropriate time to discuss the wearing of protective clothing. As mentioned before, the wearing of coveralls, yellow shoes or shoe covers, and a hat is mandatory for those actively engaged in the operation and maintenance of the equipment. The wearing of an additional pair of **coveralls, rubber** gloves taped to the coveralls, booties, and respiratory protection is required for those jobs where gross amounts of contamination are either expected or found. Some of these jobs included, but are not limited to working inside any glove box, when gloves or sides have been removed and **rodding** the tower from "H" Area,

In most instances, when wearing two pairs of coveralls (paper coveralls on the outside) is required, operation will set up a "hot line" and lay paper down around the immediate work vicinity. Before leaving the "hot line", be sure to remove the paper coveralls, outer gloves, and booties to prevent the spread of contamination to other areas. Place

the contaminated clothing and equipment in the proper containers. **Bag** contaminated equipment removed from the glove box or tower.

Before leaving the Oxide Conversion Area, you should check your hands, face, and coveralls. If your hands are greater than **100** c/m, scrub them; if your face is greater than **100** c/m, take a shower; if your coveralls are greater than **5000** c/m, change coveralls. You should always check yourself after working in this area.

Let us now talk about the proper procedure for working in a glove box. In Operating Specification RR 2.6, titled, "Operation of Glove Boxes," the statement is **made**, "Always leave **36"** gloves, which are attached to port holes, outside after using." If this is followed, many of our present problems concerning holes in gloves would be solved. The gloves would not be exposed to the corrosive atmosphere of fluorine and the high temperature inside some of the glove boxes. Following this procedure would also permit an employee to inspect the gloves before using them. It would also ensure when a glove is removed the the contaminated side is inside. **When** using the glove box gloves, always wear a pair of **white** cotton gloves. Also, be sure that the **"O" rings** holding the gloves to the ports are in their proper location. There are many jobs that are now being performed through open glove ports that could be done using the gloves. **When** a glove must be removed, inform the operations foreman or his representative that a glove is to be removed; permission must be granted before removal. Operations will provide **auxiliary** ventilation to the box to assist in lowering airborne contamination outside the box. The removal of gloves and panels

must be kept at an absolute minimum.

The Oxide Conversion Area has been equipped with three different types of air sampling equipment: the continuous air **samples, recording** type and the staplex or grab sampler. The continuous samples draw a measure flow of air through a filter paper by means of an air jet. The filter paper is mounted on an **IBM** card. The cards are changed at the beginning of each shift. In the Oxide Conversion Area, there are eight continuous air sample locations. These filter papers are counted by the Health Physics Department and the airborne contamination level determined. There are six recording air samplers in the areas making up the Oxide Conversion Facility. Air is drawn through a filter paper by means of a pump on the sampler. The filter paper is continuously monitored and the reading recorded **on** a moving chart by the instrument. An increase in reading of 90 c/m over one hour's time or **45 c/m** in $\frac{1}{2}$ hour or approximately **25 c/m** in 15 minutes is equivalent to PAL. Natural background radiation may obscure airborne activity caused by the release of uranium, Therefore, it is significant to note that background buildup usually starts at a slow rate, increases and ultimately becomes steady or drops off; whereas, uranium airborne activity **usually starts** with a sharp increase and does not decay off.

The staplex or grab **sample** is used to determine the airborne activity in a particular location during or after a special job. The **impactor** type sampler is used almost exclusively in the Oxide Conversion Area. The **impactor** operates on the theory of separating each particle according to its size and velocity. The large particles impinge on an

adhesive plate placed in such a position that the light particles and gases change their direction approximately 180 degrees and are not collected; whereas, the large **particles** in this case being airborne uranium and the lighter particles (and gases) being natural radioactivity. After drawing a measured amount of air through the sampler, the adhesive plate is removed and the level of activity determined with a PI or Samson. On the day shift the Health Physics monitor will take an **impactor** sample at any time when the airborne activity in an area is unknown. On the off shifts the Fire Department is trained to provide the same service.

Now let us talk about some of the other items in the overall radiological protection program. Probably the one that you are most familiar with is the urine sampling program. At the present, each employee, both operations and maintenance who work in the Oxide Conversion Facility, are on a weekly sampling period. This is a Type I sample. There are also Type II and III. If your Type I sample shows greater than 5 d/m/100 ml alpha and/or 0.01 **mg/liter** of uranium, you will be recalled for a second sample. This is a Type II sample. A laboratory error, insufficient sample, and a lost sample which requires a resample are also Type II. The Type III samples are those requested by supervision or the Medical Department due to circumstance of an individual being accidentally exposed to high airborne activity. A urinary work restriction is imposed when a sample shows 45 d/m/100 ml or greater alpha activity and/or 0.3 **mg/liter** of uranium, and the reading is considered valid. The work restriction is removed when the alpha activity has dropped to 5 d/m/100 ml

or less and the uranium is less than 0.01 mg/liter. Both the imposing and removal of urinary work restriction is at the discretion of the Medical Director. The work activity of employees on **restriction** is a decision between the Medical Department and the employee's supervision. The frequency of submitting routine samples depends on your work location and the work you are doing.

Kidney burden for soluble forms of uranium can be readily computed from urinary excretion data. In the case of insoluble uranium compounds such as uranium oxides, the urinary excretion rates are too low for accurate results. In-vivo counting for those insoluble compounds is more suitable and reliable. The in-vivo program is carried out in the Mobile In-Vivo Radiation Laboratory here on plantsite. The counter visits plantsite approximately every six months. Employees whom the Medical Department feels require more frequent in-vivo determinations may be sent to the Oak Ridge counter or some place where the mobile unit is located. To determine the uraniumlung burden, a twenty minute count in the shielded room is required, **The** dose calculations are quite involved; therefore, we will not discuss them at this time.

Probably the information that interests you most is the work restriction criteria. There are two classes of work restrictions: a Class I restriction is defined as a work assignment in which the individual is neither knowingly exposed to any form of uranium material or assigned to areas where there is a reasonable probability of any airborne uranium compounds. A Class II restriction limits the individual to work in **areas** where the average airborne alpha activity is not expected to

exceed 15 percent of the plant limit. This permissible activity limit may be specified as lower than 15 percent depending on the chemical form of the uranium and the circumstances involved.

The lung burden varies with assay; for instance, at 10 percent assay, 330 micrograms of ^{235}U is equivalent to one lung burden; whereas, at 90 percent assay, only 260 micrograms of ^{235}U is equivalent to one lung burden,.

This concludes the remarks; if you have any questions, I **will** be glad to answer them.